

What is claimed:

1. A therapeutical composition containing purified fraction(s) of at least two compounds  
being or containing a pathogen inhibiting oligosaccharide sequence selected from the  
5 pathogen receptors

as defined in the formula



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wherein x is linkage position 3 or 4, Sacch1 is GlcNAc $\beta$ 3, Gal $\alpha$ 3, GalNAc $\beta$ 4,  
Gal $\alpha$ 4, or Neu5X $\alpha$ 3/6, wherein X is independently either Ac or Gc;

n1, n2, n3, n4, m1, m2, and m3 are independently integers 0 or 1

with the provisions that m2 may be 1 only when x is 3 and m1 is 0 and m3 is 1;

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m3 may be 0 only when Sacch1 is Neu5X $\alpha$ 3, Gal $\alpha$ 3, GalNAc $\beta$ 4 or Gal $\alpha$ 4;

when n4 is 1, then m3 is 0 and n3 is 0, and

when n4 is 0, then m1 is 1 or m2 is 1 or n3 is 1;

R<sub>2</sub> is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide  
comprising a hydroxyl fatty acid and

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Sacch1 is Gal $\alpha$ 3 or GalNAc $\beta$ 4 with the provision that when at least two receptors  
are used these have at least one different variable selected from the group  
consisting of Sacch1, x, m2, and n4 with the provision that two sialic acid receptors  
or two neolacto receptors cannot be selected;

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and with the provision that when the composition contains only one receptor  
according to formula (I) then it is together with at least one alpha-hexose receptor  
as defined in the formula



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wherein Hex is Gal or Man, n is independently 0 or 1, p and r are linkage position 3  
or 6 between Man residues, with the provision that when Hex is Man, then p is 3  
and then r is 6, and when p is 6, then r is 3, and when Hex is Gal, then p is 4 and n  
is 0, with the provision that when Hex is Gal it is not with Gal $\alpha$ 4Gal-receptor  
35 according to the formula I;

for use as a medicament.

2. A therapeutical composition according to claim 1 wherein when the terminal activating sequence is Gal $\alpha$ 4, the composition may comprise the partial epitope Gal $\alpha$ 4Gal and optionally a Mannose receptor comprising the oligosaccharide sequence

5     Man $\alpha$ 3[(Man  $\alpha$ 6)]<sub>n</sub>Man,

wherein n is 0 or 1.

3. A therapeutical composition according to claim 1 containing purified fraction(s) of at  
10     least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from the pathogen receptors as defined by the formula



15     wherein m3 and n4 are independently integers 0 or 1

wherein the natural type non-reducing end activator sequence A1 is selected from the group consisting of GalNAc $\beta$ 4, Gal $\alpha$ 4, Neu5X $\alpha$ 3, Neu5X $\alpha$ 6, GalNAc $\beta$ 3Gal $\alpha$ 4, Gal $\beta$ 3GalNAc $\beta$ 4, Gal $\beta$ 4GlcNAc $\beta$ 3, GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc, Gal $\beta$ 3GlcNAc $\beta$ 3, Neu5X $\alpha$ 3Gal $\beta$ 4GlcNAc $\beta$ 3, Neu5X $\alpha$ 6Gal $\beta$ 4GlcNAc $\beta$ 3, and Gal $\beta$ 3(Fuc $\alpha$ 3)GlcNAc $\beta$ 3,

20     wherein X is independently either Ac or Gc, and A2 is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide comprising a hydroxyl fatty acid.

4. A therapeutical composition according to claim 3, wherein A1 is selected from the group consisting of Gal $\alpha$ 4, Neu5X $\alpha$ 3, Neu5X $\alpha$ 6, Gal $\beta$ 4GlcNAc $\beta$ 3 or Gal $\beta$ 3GlcNAc $\beta$ 3.

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5. A therapeutical composition according to claim 1, containing purified fraction(s) of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence selected from the pathogen receptors as defined by the formula

30     [Sacch1]<sub>m1</sub>[Gal $\beta$ x(Fuc $\alpha$ 4)<sub>m2</sub>GlcNAc $\beta$ 3]<sub>m3</sub>Gal $\beta$ 4Glc[ $\beta$ A2]<sub>n4</sub> (1c)

wherein x is linkage position 3 or 4, Sacch1 is GlcNAc $\beta$ 3, Gal $\alpha$ 3, GalNAc $\beta$ 4, Gal $\alpha$ 4, or Neu5X $\alpha$ 3/6, wherein X is independently either Ac or Gc;

n4, m1, m2, and m3 are independently integers 0 or 1,

35     with the provisions that m2 may be 1 only when x is 3,

when Sacch1 is GlcNAc $\beta$ 3 then m3 is 1 and x is 4, and

m3 may be 0 only when m1 is 1 or when n4 is 1,

when n4 is 0, then m1 is 1 or m3 is 1;

A2 is a ceramide comprising a hydroxyl fatty acid or an analog of a ceramide comprising a hydroxyl fatty acid, and  
with the provision that at least two receptors are selected so that these have at least one  
different variable selected from the group Sacch1, x, m2, n4, preferably with the provisio  
5 that not two sialic acid receptors are selected.

6. A therapeutical composition according to claim 1, containing purified fraction(s) of at  
least two compounds being or containing a pathogen inhibiting oligosaccharide sequence  
selected from the pathogen receptors as defined by the formula  
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wherein x is linkage position 3 or 4, Sacch1 is Gal $\alpha$ 4, Neu5X $\alpha$ 3 or Neu5X $\alpha$ 6, wherein X  
is independently either Ac or Gc;  
15 m1, and m3 are independently integers 0 or 1,  
with the provision that either m1 is 1 or m3 is 1,  
with the provision that at least two receptors are selected so that these have at least one  
different variable Sacch1 or x, preferably with the provisio that not two sialic acid  
receptors are selected.

20 7. A therapeutical composition according to claim 6, wherein the oligosaccharide  
sequences are selected from the group consisting of Gal $\alpha$ 4Gal $\beta$ 4Glc,  
NeuNAc $\alpha$ 3Gal $\beta$ 4Glc, NeuNAc $\alpha$ 6Gal $\beta$ 4Glc, NeuNAc $\alpha$ 3Gal $\beta$ 4GlcNAc,  
NeuNAc $\alpha$ 6Gal $\beta$ 4GlcNAc, Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4Glc and Gal $\beta$ 3GlcNAc $\beta$ 3Gal $\beta$ 4Glc.

25 8. A therapeutical composition according to claim 1, wherein at least one sialylated  
oligosaccharide, preferably a bovine milk fraction comprising sialylated oligosaccharides,  
such as NeuNAc $\alpha$ 3Gal $\beta$ 4Glc, NeuNAc $\alpha$ 6Gal $\beta$ 4Glc or NeuNAc $\alpha$ 6Gal $\beta$ 4GlcNAc, is used  
together with at least one neutral oligosaccharide, preferably Gal $\alpha$ 4Gal $\beta$ 4Glc,  
30 Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4Glc (LNnT) or Gal $\beta$ 3GlcNAc $\beta$ 3Gal $\beta$ 4Glc (LNT).

9. A therapeutical composition according to claim 6, wherein said pathogen inhibiting  
oligosaccharides comprise a mixture of two different types of oligosaccharides selected  
from the group consisting of globo-oligosaccharides, Neolacto-oligosaccharides, and sialyl-  
35 oligosaccharides, preferably Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4Glc, Gal $\alpha$ 4Gal $\beta$ 4Glc, and/or  
sialyllactoses.

10. Use of a single monovalent oligosaccharide according to formula



wherein x is linkage position 3 or 4, Sacch1 is Gal $\alpha$ 4, Neu5X $\alpha$ 3 or Neu5X $\alpha$ 6, wherein X  
 5 is independently either Ac or Gc;  
 m1, and m3 are independently integers 0 or 1,  
 with the provision that either m1 is 1 or m3 is 1,  
 for the manufacture of a therapeutic composition for treatment of diseases caused in  
 humans by non-toxin secreting diarrheagenic *E. coli*.

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11. A therapeutical composition comprising a purified fraction(s) of at least two  
 compounds being or containing a pathogen inhibiting oligosaccharide sequence selected  
 from at least two of the following groups of pathogen receptors:

15 a) lactosylceramide receptors as defined in the formula



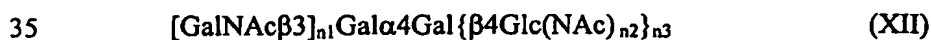
wherein x is linkage position 3 or 4, R<sub>2</sub> is a ceramide comprising a hydroxyl fatty  
 20 acid or an analog of a ceramide comprising a hydroxyl fatty acid, and R<sub>1</sub> is Gal $\alpha$ ,  
 Gal $\beta$ , GalNAc $\beta$ , GlcNAc $\beta$  or a longer oligosaccharide comprising Gal $\alpha$ , Gal $\beta$ ,  
 GalNAc $\beta$  or GlcNAc $\beta$  at the reducing end or Neu5X $\alpha$ , wherein X is Ac or Gc,  
 with the proviso that when R<sub>1</sub> is GlcNAc $\beta$  or Neu5X $\alpha$  then x is 3;

25 b) ganglio-receptors as defined in the formula



wherein n1, n2 and n3 are independently integers 0 or 1, with the proviso that  
 30 either n1 or n3 is 1, and with the proviso that no sialic acids are linked to the  
 oligosaccharide sequence;

c) Gal $\alpha$ 4Gal-receptors as defined in the formula



wherein n1, n2, and n3 are independently integers 0 or 1, and the GalNAc-residue  
 is optionally further substituted by other monosaccharide residues;

d) lacto-receptors as defined in the formula



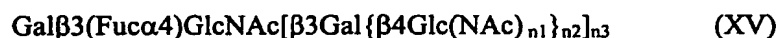
wherein  $n1$ ,  $n2$ , and  $n3$  are independently integers 0 or 1;

e) neolacto-receptors as defined in the formula



wherein  $n1$ ,  $n2$ ,  $n3$  and  $n4$  are independently integers 0 or 1, when  $n1$  is 1, the non-reducing terminal GlcNAc can be further substituted by a monosaccharide residue or an oligosaccharide;

f) fucosyl-receptors as defined in the formula



wherein  $n1$ ,  $n2$ , and  $n3$  are independently integers 0 or 1;

g) sialic acid-receptors as defined in the formula



wherein independently X is either Ac or Gc meaning that the sialic acid is either Neu5Ac or Neu5Gc,  $n1$  and  $n2$  are either 0 or 1, p is linkage position 3 or 6, r and s are linkage positions 3 or 4 with the proviso that when r is 3 then s is 4 and when r is 4 then s is 3;

h) mannose receptors as defined in the formula



wherein n is independently 0 or 1, p and r are linkage position 3 or 6 between the Man residues, with the proviso that when p is 3 then r is 6, and when p is 6 then r is 3;

for use as a medicament.

12. The composition according to claim 11, wherein the pathogen receptor of group a) is selected from the group of receptor oligosaccharide sequences consisting of:

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lactosylceramide, lactosylceramide comprising hydroxyl fatty acids,  
lactosylceramide with modified carbon 3 of a galactose residue and  
isoglobotriaocylceramide

10 13. The composition according to claim 11, wherein the pathogen receptor of group b) is selected from the group of receptor oligosaccharide sequences consisting of:

Gal $\beta$ 3GalNAc $\beta$ 4Gal $\beta$ 4Glc, Gal $\beta$ 3GalNAc $\beta$ 4Gal, Gal $\beta$ 3GalNAc, GalNAc $\beta$ 4Gal  
and GalNAc $\beta$ 4Gal $\beta$ 4Glc

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14. The composition according to claim 11, wherein the pathogen receptor of group c) is selected from the group of receptor oligosaccharide sequences consisting of:

Gal $\alpha$ 4Gal $\beta$ 4Glc, Gal $\alpha$ 4Gal $\beta$ 4GlcNAc and Gal $\alpha$ 4Gal

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15. The composition according to claim 11, wherein the variable n3 of group d) is 1.

16. The composition according to claim 11, wherein the pathogen receptor of group d) is selected from the group of receptor oligosaccharide sequences consisting of:

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Gal $\beta$ 3GlcNAc $\beta$ 3Gal, Gal $\beta$ 3GlcNAc $\beta$ 3Gal $\beta$ 4Glc, Gal $\beta$ 3GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc  
and Gal $\beta$ 3GlcNAc $\beta$ 3Gal $\beta$ 3GlcNAc

17. The composition according to claim 11, wherein said monosaccharide residue of group e) is Gal $\beta$ 4, or said oligosaccharide of group d) is GlcNAc $\beta$ 3Gal $\beta$ 4, or the variable n1 or n4 of group e) is 1.

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18. The composition according to claim 11, wherein the pathogen receptor of group e) is selected from the group of receptor oligosaccharide sequences consisting of:

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GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc, Gal $\beta$ 4GlcNAc $\beta$ 3Gal, Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4Glc, Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc, GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4Glc, and GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc

5 19. The composition according to claim 11, wherein the variable n3 of group f) is 1.

20. The composition according to claim 11, wherein the pathogen receptor of group f) is selected from the group consisting of:

10 receptor oligosaccharide sequences with Lewis a structure

21. The composition according to claim 20, wherein said oligosaccharides with Lewis a structure are selected from the group of receptor oligosaccharide sequences consisting of:

15 Gal $\beta$ 3(Fuc $\alpha$ 4)GlcNAc $\beta$ 3Gal, Gal $\beta$ 3(Fuc $\alpha$ 4)GlcNAc $\beta$ 3Gal $\beta$ 4GlcNAc or Gal $\beta$ 3(Fuc $\alpha$ 4)GlcNAc $\beta$ 3Gal $\beta$ 4Glc

22. The composition according to claim 11, wherein the pathogen receptor of group g) is selected from the group of receptor oligosaccharide sequences consisting of:

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oligosaccharides with Neu5X $\alpha$ 3Gal $\beta$ 3(Fuc $\alpha$ 4)GlcNAc, Neu5X $\alpha$ 3Gal $\beta$ 4(Fuc $\alpha$ 3)GlcNAc, Neu5X $\alpha$ 3Gal $\beta$ 4(Fuc $\alpha$ 3)Glc, Neu5X $\alpha$ 3Gal $\beta$ 3GlcNAc, Neu5X $\alpha$ 3Gal $\beta$ 4GlcNAc, Neu5X $\alpha$ 3Gal $\beta$ 4Glc, Neu5X $\alpha$ 6Gal $\beta$ 4GlcNAc or Neu5X $\alpha$ 6Gal $\beta$ 4Glc structures

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23. The composition according to claim 11, wherein the pathogen receptor of group h) is selected from the group consisting of Man $\alpha$ 3(Man $\alpha$ 6)Man-conjugates.

24. The composition according to claim 11, wherein at least one of said compounds is in monovalent form.

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25. The composition according to claim 11, wherein at least one of said compounds is linked to a polyvalent carrier.

35 26. The composition according to claim 24, wherein said monovalent form is a glycosylamine or a glycosylamide or a methyl glycoside or a glycoside including other N-glycosides, C-glycosides or S-glycosides

27. The composition according to claim 25, wherein said polyvalent carrier is a carbohydrate carrier or a particle carrier.
28. The composition according to claim 27, wherein said carbohydrate carrier is soluble.
- 5 29. The composition according to claim 27 or claim 28, wherein said carbohydrate carrier is a bacterial polysaccharide or part of bacterial polysaccharide also comprising the receptor oligosaccharide sequence.
- 10 30. The composition according to claim 27, wherein said particle carrier is a carbohydrate particle, a synthetic polymer particle or a cell.
31. The composition according to claim 27, wherein said carbohydrate carrier is an antigenic or immunostimulating carbohydrate conjugate.
- 15 32. The composition according to any of the claims 1-31, wherein pathogen inhibiting oligosaccharide sequence can cross-link the pathogens to immune cells or immune defence proteins such as antibodies or lectins.
- 20 33. The composition according to any of the claims 1-31, wherein said medicament is for prophylaxis or treatment of gastrointestinal infection.
34. The composition according to claim 33, wherein said gastrointestinal infection causes diarrhea.
- 25 35. The composition according to claim 33 or 34, wherein said infection causes traveller's diarrhea, children's diarrheas, persistent diarrhea, watery diarrhea, hemorrhagic colitis or haemolytic uremic syndrome.
- 30 36. The composition according to claim 35, wherein said infection is caused by EPEC (enteropathogenic *Escherichia coli*), ETEC (enterotoxigenic *Escherichia coli*), EHEC (enterohemorrhagic *Escherichia coli*), EIEC (enteroinvasive *Escherichia coli*) or EAEC (enteroaggregative *Escherichia coli*).
- 35 37. The composition according to any of the claims 33-35, wherein infection is caused by *Vibrio* species including *Vibrio cholerae*, *Campylobacter* species including *Campylobacter jejuni*, intestinal eukariotic parasites including the *Entamoeba* species, *Salmonella*



including *Salmonella typhimurium*, *Shigella* species, *Aeromonas* species, zoonotic *Helicobacter* species, *Listeria* species or rotavirus.

5 38. The composition according to any of the claims 33-37, wherein the cause of infection is not diagnosed.

39. Use of a composition comprising a purified fraction(s) of at least two compounds as defined in any of the claims 1-38 for the manufacture of a medicament for prophylaxis or treatment of a gastrointestinal infection.

10 40. The composition according to any of the claims 1-38, wherein said medicament is for prophylaxis or treatment of a lung disease.

15 41. The composition according to any of the claims 1-38, wherein said medicament is used for the treatment of a human patient.

42. The composition according to any of the claims 1-38, wherein said medicament is used for the treatment of an animal patient.

20 43. The composition according to any one of claims 1-38 or 40-42 further comprising one or several oligosaccharide sequences selected from the group of:

25 oligosaccharides comprising sequences  $\text{Fuca}_2\text{Gal}$ ,  $\text{Fuca}_3\text{GlcNAc}$ ,  $\text{Fuca}_3\text{Glc}$ ,  $\text{NeuNAc}\alpha 8\text{NeuNAc}$ ,  $\text{Fuca}_2\text{Gal}\beta 3/4\text{GlcNAc}$ ,  $\text{Fuca}_2\text{Gal}\beta 4\text{Glc}$ ,  $\text{Fuca}_2\text{Gal}\beta 4(\text{Fuca}_3)\text{Glc}$ ,  $\text{Gal}\beta 4(\text{Fuca}_3)\text{GlcNAc}$ ,  $\text{Fuca}_2\text{Gal}\beta 3/4(\text{Fuca}_4/3)\text{GlcNAc}$  and ganglioseries ganglioside oligosaccharide sequences.

30 44. A nutritional composition or a nutritional additive comprising a purified fraction(s) of at least of two compounds as defined in any of the claims 1-32 for prophylaxis or treatment of gastrointestinal infection.

45. A nutritional composition or a nutritional additive according to claim 44 further comprising a probiotic microorganism or a prebiotic substance.

35 46. Use of a composition comprising a pathogen receptor as defined in any of the claims 1-30 as a part of filter material to purify pathogens from liquid food, beverages and water by filtering.

47. Use of composition comprising pathogen receptors as defined in claim any of the claims 1-30 in diagnostics of a pathogen binding to at least three oligosaccharide sequences as defined in any of the claims 1-23.
- 5 48. Use of composition comprising pathogen receptors as defined in any of the claims 1-30 in diagnostics of a pathogen binding to at least four oligosaccharide sequences as defined in any of the claims 1-23.
- 10 49. Use according to claim 47 or 48, wherein said pathogen is EPEC (enteropathogenic *Escherichia coli*), ETEC (enterotoxigenic *Escherichia coli*), EHEC (enterohemorrhagic *Escherichia coli*) EIEC (enteroinvasive *Escherichia coli*) or EAEC (enteroaggregative *Escherichia coli*).
- 15 50. Use according to claim 47 or 48, wherein said pathogen is *Vibrio* species including *Vibrio cholerae*, *Campylobacter* species including *Campylobacter jejuni*, intestinal eukariotic parasites including the *Entamoeba* species, *Salmonella* including *Salmonella typhimurium*, *Shigella* species, *Aeromonas* species, zoonotic *Helicobacter* species, *Listeria* species or rotavirus together with any of the pathogens according to claim 39.
- 20 51. Use of composition comprising pathogen receptors as defined in claim any of the claims 1-30 in coating surfaces of food products for improved food safety.
- 25 52. A method of treatment for a gastrointestinal infection, wherein a pharmaceutically effective amount of a composition comprising purified fractions of at least two compounds being or containing a pathogen inhibiting oligosaccharide sequence, wherein said compounds separately inhibit pathogen binding to relevant carbohydrate receptors on an infected tissue, is administered to a subject in need of such treatment.
- 30 53. A method of treatment according to claim 52, wherein said composition is the composition defined in any one of claims 1-43.
- 35 54. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups a), b), d), e), or f) defined in any of the claims 1-23 for use in prophylaxis or treatment of diarrhea due to the presence of EHEC (enterohemorrhagic *Escherichia coli*) in gastrointestinal tract of a patient.

55. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups a), b), c), e) or g) defined in any of the claims 1-23 for use in prophylaxis or treatment of diarrhea due to the presence of EPEC (enteropathogenic *Escherichia coli*) in gastrointestinal tract of a patient.

56. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups a), b), c), d), e), f) and g) defined in claim 11 for use in prophylaxis or treatment of diarrhea due to the presence of ETEC (enterotoxigenic *Escherichia coli*) in gastrointestinal tract of a patient.

57. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups c), d), e), g) and h) defined in any of the claims 11-23 for use in prophylaxis or treatment of diarrhea due to the presence of EAEC (enteroaggregative *Escherichia coli*) in gastrointestinal tract of a patient.

58. A therapeutical composition comprising a compound being or containing a pathogen inhibiting oligosaccharide sequence selected from any one of the groups c), d), e), g), f) or h) defined in any of the claims 11-23 for use in prophylaxis or treatment of diarrhea due to the presence of EIEC (enteroinvasive *Escherichia coli*) in gastrointestinal tract of a patient.

59. Use of a protein linked receptor selected from the group consisting of:

lacto-receptors, neolacto-receptors, fucosyl-receptors, mannose receptors or sialic acid receptors

for analysis or diagnosis of pathogen binding.

60. Use of a protein linked receptors defined in claim 59 for analysis or diagnosis of binding of probiotic bacteria or microbes.

61. Use of a protein linked receptors defined in claim 59 for a search or design of analogous oligosaccharide substances.

62. Use according to any one of the claims 59-61, wherein said protein linked receptor comprises at least part of a O-glycan or N-glycan core structure of the receptor defined in claim 59.

63. Use according to any one of the claims 59-61, wherein said protein linked receptor comprises a terminal non-reducing end oligosaccharide sequence present in epithelium of human intestine, human stomach or human larynx.
- 5 64. A soluble polyvalent substance comprising at least two oligosaccharide sequences sequences from different groups defined in any of the claims 1-23.
65. Infant formula comprising at least two oligosaccharide sequences from different groups defined in any of the claims 1-23.
- 10 66. A food preservative comprising at least two oligosaccharide sequences from different groups defined in any of the claims 1-23.
- 15 67. A mouth hygiene product comprising at least one of the oligosaccharide sequences defined in any of the claims 1-23.
68. A mouth hygiene product comprising at least two of the oligosaccharide sequences from two different groups defined in any of the claims 1-23.
- 20 69. A mouth hygiene product according to the claim 67 or 68 when the product is selected from group consisting of: tooth pastes, mouth wash solutions, tablets, and chewing gums.
70. A topical, washing or cosmetic product comprising at least one of the oligosaccharide sequences defined in any of the claims 1-23.
- 25 71. A topical, washing or cosmetic product comprising at least two of the oligosaccharide sequences from two different groups defined in any of the claims 1-23.
- 30 72. A topical, washing or cosmetic product according to the claim 67 or 68 when the product is selected from the group consisting of: tooth pastes, mouth wash solutions, tablets, cleanser, disinfectant and chewing gums.
73. Use of a composition defined in any of the claims 1-23 for non-diagnostic inhibition or agglutination of pathogen *ex vivo*.
- 35 74. Use according to claim 73 when the pathogen is *E. coli*.

75. Composition according to any of the claims 1-38 or 40-46 when one of the oligosaccharide sequences is replaced corresponding partial oligosaccharide sequence comprising non-reducing pyranose formed monosaccharide residue selected from the group consisting of:

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Man $\alpha$  NeuNAc $\alpha$ , Gal $\beta$ , Gal $\alpha$ , Fuca, and GlcNAc $\beta$

for use as medicament.

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76. The polysialic acid composition comprising at least 95 % of sialic acid oligosaccharides are less than ten sialic acid residues long for use as medicament.

77. Use of a composition according to claim 76 for the manufacture of a medicament for prophylaxis or treatment of a gastrointestinal infection.

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78. The composition according to claim 35, wherein said infection is caused by a pathogenic *E. coli* and/or zoonotic *Helicobacter* species.

79. A diarrheagenic *E. coli* inhibiting substance according to

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the formula



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wherein PO is an oligomeric or polymeric carrier structure, OS is an oligosaccharide sequence according to the invention, n is an integer  $\geq 1$  indicating the number of oligosaccharide groups covalently attached to the carrier PO, S is a spacer group, p, q and r are each 0 or 1, whereby at least one of p and r is different from 0, y and z are linking groups, at least one of y and z being an O-hydroxylamine residue  $-\text{O}-\text{NH}-$  or  $-\text{O}-\text{N}=\text{}$ , with the nitrogen atom being linked to the OS and/or PO structure, respectively, and the other y and z, if present, is a chemoselective ligation group.

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